Energy Efficiency Adjustments for a Managed Forecast: Estimates of Incremental Uncommitted Energy Savings Relative to the *California Energy Demand Forecast 2012-2022*

Introduction

This memorandum describes an assessment of the *incremental* impacts of energy efficiency potential savings not incorporated in the *California Energy Demand 2012-2022 Final Forecast* (*CED 2011*), the demand forecast adopted by the California Energy Commission (Energy Commission) in June 2012 as part of the 2012 Integrated Energy Policy Report (IEPR).[1] In this context, incremental refers to electricity and natural gas savings from potential impacts that are net of any overlap with savings already included in *CED 2011*. These savings were not incorporated in *CED 2011* because they were not considered *committed*, or firm. This analysis uses *CED 2011* as the reference point, since this forecast will be used in procurement assessments at the California Public Utilities Commission (CPUC). Savings results were developed for the four major investor-owned utility (IOU) service territories for electricity consumption, electricity peak demand, and natural gas consumption.

Incremental uncommitted savings estimates are based on *Analysis to Update Energy Efficiency Potential, Goals, and Targets for 2013 and Beyond: Track 1 Statewide Investor-Owned Utility Energy Efficiency Potential Study* (*2012 Potential Study*), completed for the CPUC by Navigant Consulting, Inc. in May 2012.[2] The *2012 Potential Study* estimated energy efficiency savings that could be realized through utility programs as well as codes and standards beginning in 2006,[3] given current or soon-to-be-available technologies.[4]

The estimates provided here are meant to be incorporated in the CPUC's long-term procurement process (LTPP) as a key component in determining a *managed forecast* for procurement purposes. Three scenarios were developed: a *high savings case*, a *mid savings case*,

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1 Kavalec, Chris, Nicholas Fugate, Tom Gorin, Bryan Alcorn, Mark Ciminelli, Asish Gautam, Glen Sharp, and Kate Sullivan. 2012. *California Energy Demand Forecast 2012-2022 (Volume 1* and *Volume 2)* California Energy Commission, Electricity Supply Analysis Division. Publication Number: CEC-200-2012-001-CMF. http://www.energy.ca.gov/2012_energypolicy/documents/index.html.

2 Available at: http://www.cpuc.ca.gov/NR/rdonlyres/6FF9C18B-CAA0-4D63-ACC6-F9CB4EB1590B/0/2011IOUServiceTerritoryEEPotentialStudy.pdf.

3 The analysis begins in 2006 because it is essentially an update of the 2008 potential study by Itron, which uses 2006 as a base year (Itron study available at http://www.calmac.org/startDownload.asp?Name=PGE0264_Final_Report.pdf&Size=5406KB.)

4 Energy Commission staff had planned on using a new CPUC Goals Study to estimate incremental uncommitted savings, but the Goals Study has been delayed until at least the end of 2012, so could not be utilized for the 2012 LTPP.

and a *low savings case*. Each of these cases could be used by the CPUC to correspond to one of the three *CED 2011* forecast demand scenarios: the high savings case would correspond to the low demand scenario, the low savings case to the high demand forecast, and the mid savings case to the mid demand forecast.

This memorandum provides a summary of the results, describes the method used, reviews stakeholder comments, and gives detailed results at the utility level. Incremental uncommitted electricity savings were estimated for Pacific Gas and Electric (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric (SDG&E). Natural gas savings were estimated for PG&E, SDG&E, and the Southern California Gas Company (SoCalGas).

Summary of Results

Table 1 shows the savings from incremental uncommitted efficiency in the mid savings case for all IOUs combined, for electricity consumption and peak and natural gas consumption. Incremental savings begin in 2011 for consumption and 2012 for peak, as 2010 was the last historical consumption year in *CED 2011* and 2011 was the last historical year for peak data.[5]

Table 1: Incremental Uncommitted Efficiency Savings for all IOUs, Mid Savings Case

Year	Electricity Consumption (GWh)	Electricity Peak (MW)	Natural Gas Consumption (MM therms)
2011	38	-	1
2012	78	7	4
2013	810	179	42
2014	1,968	394	78
2015	3,628	740	115
2016	5,368	1,094	155
2017	6,975	1,420	200
2018	8,088	1,633	252
2019	9,811	2,019	305
2020	11,501	2,401	361
2021	13,186	2,758	415
2022	14,783	3,103	465

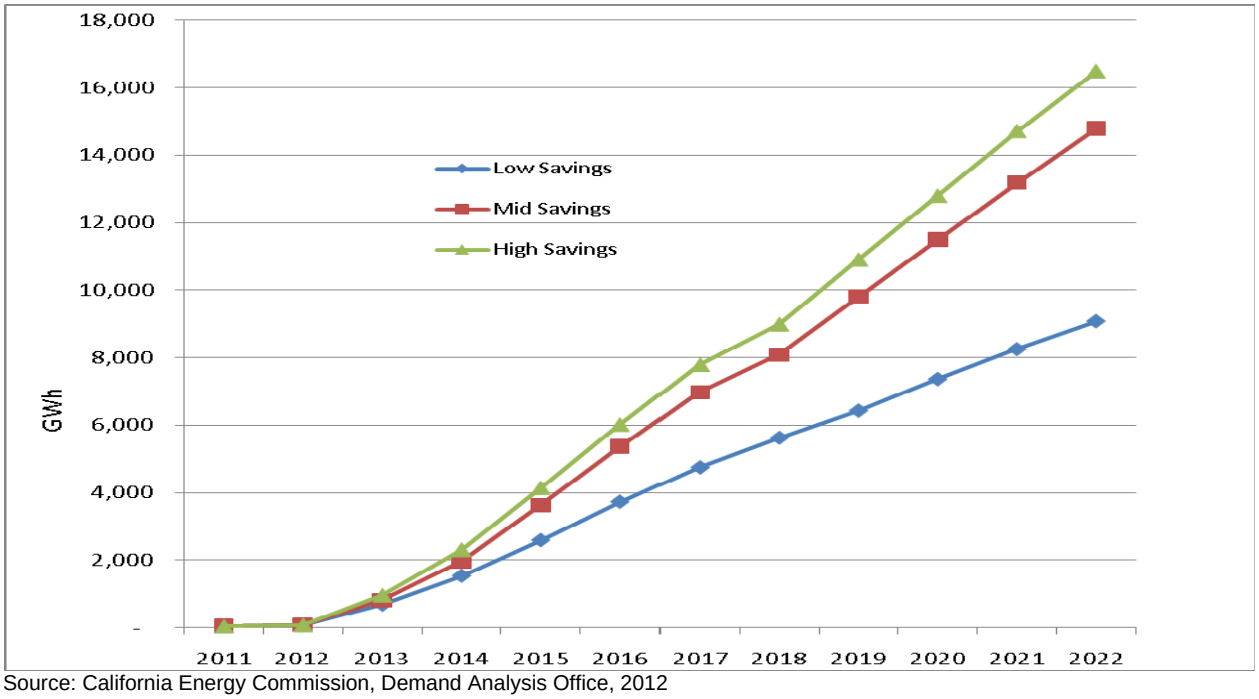
Source: California Energy Commission, Demand Analysis Office, 2012

5 *CED 2011* is calibrated to actual consumption in 2010 and actual peak demand in 2011, so no additional (incremental) savings can be estimated for these years.

By 2022, these savings amount to around 6.8 percent of projected combined IOU electricity sales, 6.0 percent of combined (non-coincident) peak, and 3.3 percent of total IOU natural gas sales.

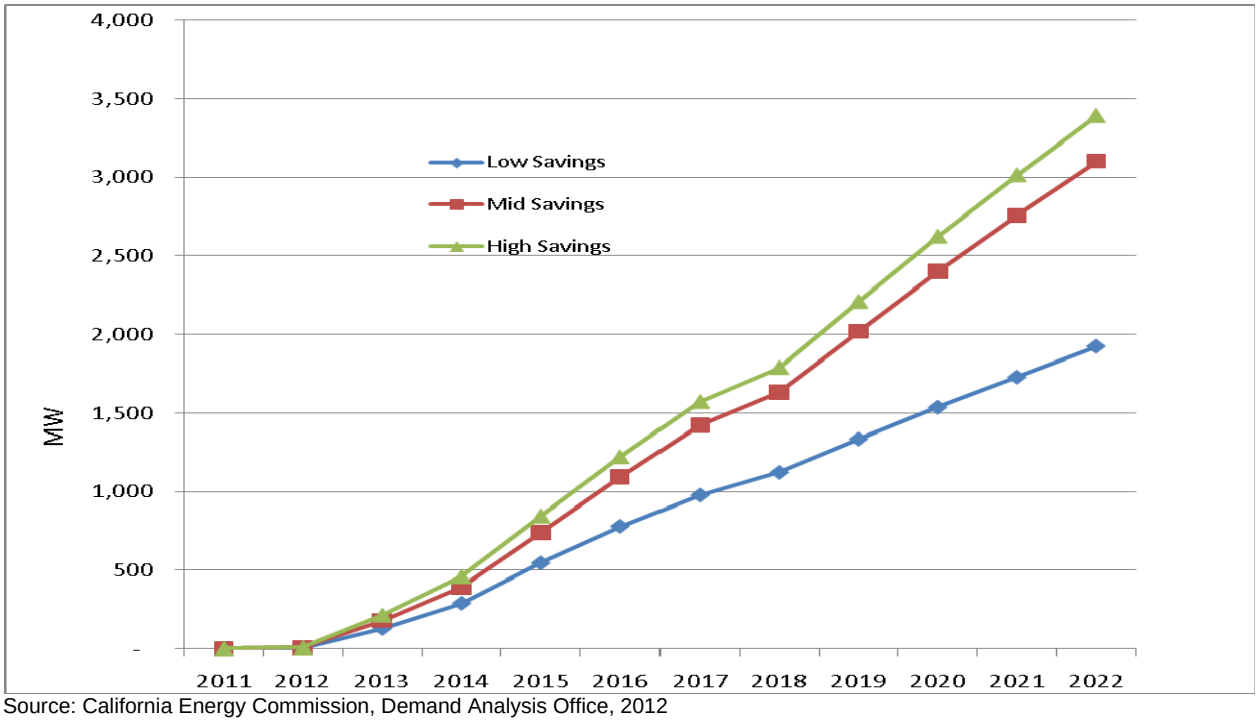
Figure 1, **Figure 2**, and **Figure 3** show the low, mid, and high savings scenarios for electricity consumption, electricity peak, and natural gas consumption, respectively. In 2020, the projected spread between the high and low savings scenarios is around 7,400 GWh for electricity consumption, 1,500 MW for peak demand, and 150 million therms for natural gas consumption. The scenarios are described in the next section.

Figure 1: Electricity Consumption Incremental Uncommitted Efficiency Savings (GWh) by Scenario, all IOUs



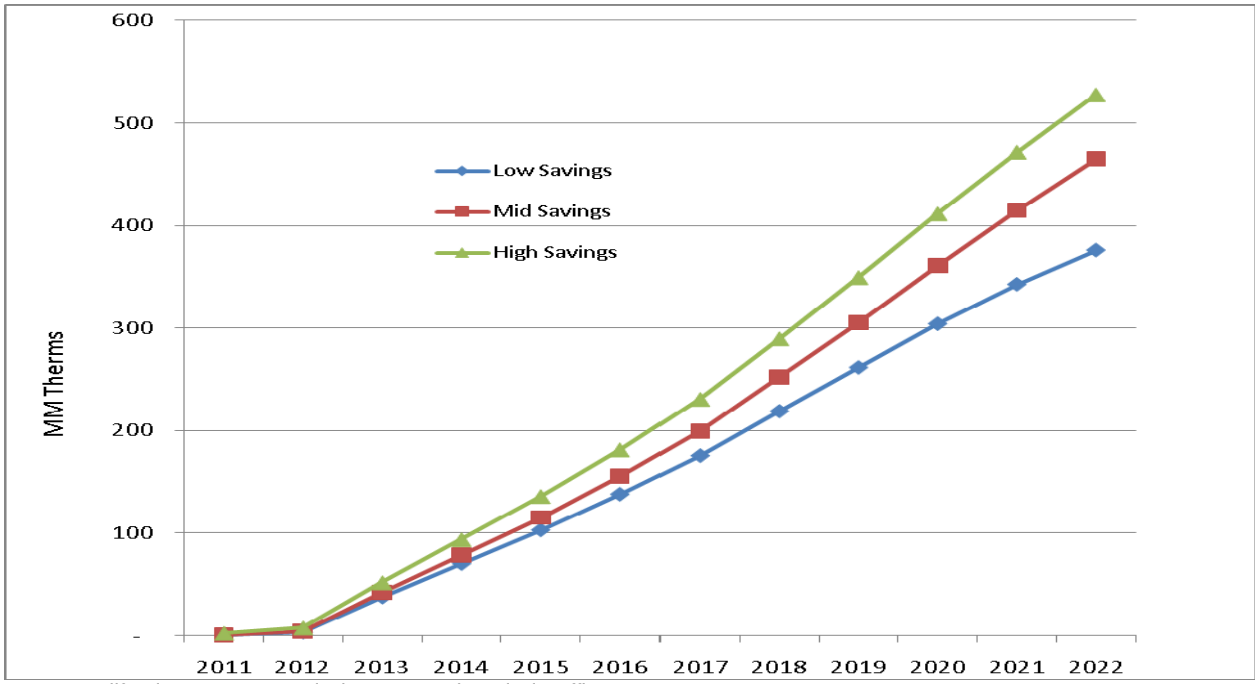
Source: California Energy Commission, Demand Analysis Office, 2012

Figure 2: Electricity Peak Demand Incremental Uncommitted Efficiency Savings (MW) by Scenario, all IOUs



Source: California Energy Commission, Demand Analysis Office, 2012

Figure 3: Natural Gas Consumption Incremental Uncommitted Efficiency Savings (MM Therms) by Scenario, all IOUs



Source: California Energy Commission, Demand Analysis Office, 2012

Table 2 provides a comparison of incremental uncommitted efficiency savings from this analysis with the estimates developed by the Energy Commission and Itron during the *2009 IEPR* process.[6] The Energy Commission/Itron estimates are higher in general because *CED 2011* now incorporates efficiency savings considered uncommitted in 2009, including Title 20 lighting savings and 2008 Title 24 commercial building standards savings; thus, new estimates of incremental impacts should be expected to be lower, all else equal. In addition, home and commercial building construction has been lower than was expected in 2009, reducing incremental Title 24 savings. On the peak side, the 2009 study included savings estimates for the CPUC's Big Bold Energy Efficiency Strategies (BBEES), which are expected to have a relatively higher impact on peak demand than consumption, and were excluded from the *2012 Potential Study*. This exclusion is discussed further in the section summarizing stakeholder comments. Also contributing to lower peak savings in the current study are reductions in peak-to-energy ratios, particularly for measures targeting air conditioning.[7]

Table 2: Comparison of Energy Commission/Itron (2009) and Energy Commission (2012) Incremental Uncommitted Efficiency Savings

		Low Savings Scenario		Mid Savings Scenario		High Savings Scenario	
	Year	Energy Commission/ Itron (2009)	Energy Commission (2012)	Energy Commission/ Itron (2009)	Energy Commission (2012)	Energy Commission/ Itron (2009)	Energy Commission (2012)
Electricity Consump-tion (GWh)	2015	3,106	2,588	4,057	3,628	4,520	4,142
	2018	8,395	5,622	9,403	8,088	10,888	8,989
	2020	10,699	7,366	12,379	11,501	14,345	12,797
Electricity Peak Demand (MW)	2015	1,080	545	1,513	740	1,749	849
	2018	2,905	1,123	3,788	1,633	4,537	1,804
	2020	4,075	1,538	5,383	2,401	6,501	2,645

Source: California Energy Commission, Demand Analysis Office, 2012

6 Reports describing this analysis are available at: http://www.energy.ca.gov/2010publications/CEC-200-2010-001/index.html.

7 In the 2009 analysis, Energy Commission and Itron staff applied peak-to-energy ratios derived from Energy Commission forecasting models. Energy Commission staff has since determined that these ratios, computed as overall peak demand vs. energy consumption by end use, may not adequately represent *marginal* impacts from efficiency measures as well as ratios derived from the Database for Energy Efficient Resources (DEER) used in the *2012 Potential Study*.

Method

Navigant Consulting and subcontractor Heschong Mahone Group (HMG) provided invaluable assistance in putting together the incremental uncommitted efficiency savings estimates, including training Energy Commission staff in the use of the models employed in the *2012 Potential Study*. These models included methodologies to estimate potential traditional program-related measure savings, savings from codes and standards, and savings from behavioral programs. In addition, Navigant and HMG developed modified versions of the models specifically for this effort.

The *2012 Potential Study* estimated gross first-year and cumulative technical, economic, and market potential efficiency impacts from the three sources of savings beginning in 2006 for electricity consumption, peak demand, and natural gas consumption.[8] In general, the effort to characterize incremental uncommitted efficiency savings consisted of determining the portion of estimated *net*[9] market potential not incorporated in *CED 2011*. For program-related measures (including behavioral), incremental uncommitted efficiency includes net accumulated savings beginning in 2013, since *CED 2011* incorporates utility programs through 2012. Incremental uncommitted savings from codes and standards includes estimated net market potential from the following expected (or recently finalized) regulations not included in *CED 2011*:

- 2011 and future Title 20 standards
- Future Federal appliance standards
- 2008 Title 24 (residential) and 2013 Title 24 standards.

The 2011 Title 20 revision targets battery chargers, while future Title 20 standards include expected updates through 2015. Future Federal standards include new appliance mandates through 2015. The residential portion of the 2008 Title 24 update, not incorporated in *CED 2011*, is included through savings that are incremental to the historical base years in the forecast (2010 for consumption and 2011 for peak demand). Additional codes and standards potential savings (for example, a Title 24 update after 2013) will be developed by Navigant for the CPUC Goals Study later this year.

Because the analyses for the Title 24 savings employed by HMG were done before the full impact of the recession on new construction was known, Energy Commission staff asked HMG to revise these estimates in response to comments from the joint IOUs (see next section). HMG

8 Natural gas consumption savings estimates incorporate *interactive* effects and thus can be negative for certain categories in the detailed results.

9 Net savings equals gross savings minus naturally occurring market savings, or "free ridership" savings that would be expected to occur without any efficiency initiative.

provided percentage reductions to be applied to these savings, based on construction data supplied by the California Building Industry Association.[10]

For the appliance standards, staff relied on HMG estimates except in the case of targeted appliances that correspond directly to end uses within the Energy Commission forecasting models. For example, future Federal standards for natural gas ranges could be incorporated in the Energy Commission's residential model (which has a specific end use for ranges), resulting in savings more consistent with *CED 2011*. Other standards that cover multiple end uses or a subset of appliances within an Energy Commission end use designation could not be simulated in this manner. Efficiency savings from the following Federal standards were estimated using Energy Commission models:

- Electric and natural gas clothes dryers
- Central air conditioning/heat pump
- Natural gas pool heaters
- Room air conditioners
- Natural gas ranges.

Program-related measures were divided by Navigant into the following categories:

- High impact measure (HIMs), which include measures with the highest savings potential.
- Secondary measures, which are expected to become HIM measures once the current crop is exhausted.
- Measures of interest, which have less potential than HIMs or secondary measures.
- Low Income measures.
- Emerging technologies (ET), which are not included in current utility portfolios.
- Behavioral programs, which target "usage-based behavior."

The detailed results included in this memorandum break out incremental uncommitted program-related savings into these categories. More information about these groupings is available in the *2012 Potential Study* report.

10 The result of this adjustment was a reduction in residential first-year savings from Title 24 of 80 percent in 2011 and 70 percent in 2012 and 2013. Commercial first-year savings in new construction was reduced by 70 percent in 2013. Energy Commission staff "ramped down" the percentage decreases starting in 2014, so that by 2016, first-year savings revert to the totals originally provided by HMG. Using 2016 as the full recovery year was a somewhat arbitrary assumption based on discussion by various economic experts during the Energy Commission's workshop on economic-demographic assumptions held on January 19, 2011.

The *CED 2011* forecasts included a substantial amount of lighting savings in anticipation of the effects of Assembly Bill 1109 (AB 1109, Huffman, Chapter 534, Statutes of 2007) through Title 20 standards. These savings can be expected to overlap with lighting savings estimated in the *2012 Potential Study*. To account for this overlap, Energy Commission staff subtracted *CED 2011* lighting savings during the forecast period from total potential codes and standards (from 2011 onward) and program-related lighting savings (starting in 2013) in the *2012 Potential Study* for each utility. This difference, which is added to the incremental uncommitted total, is reported separately in the detailed results. In some years for each utility, *CED 2011* lighting savings exceed those in the *2012 Potential Study*; lighting savings are reported as zero in these cases.

The potential efficiency estimates as delivered by Navigant formed the basis of the mid savings case, with modifications as described above. Energy Commission and CPUC staff developed high and low savings scenarios with the following elements:

- The high savings scenario assumed a 15 percent increase in incremental uncommitted program-related measure savings; the low savings case assumed a 5 percent decrease.
- The low savings scenario assumed a 20 percent lower compliance rate for codes and standards.
- The low savings scenario assumed no impacts from emerging technologies.

Assumptions for the percentage changes in program-related measure savings were derived from additional model runs made by Navigant using alternative economic-demographic assumptions (corresponding to the high and low demand assumptions used in *CED 2011*). The results of these runs showed more potential for increased savings relative to the mid case versus lower savings. The uncertainties around codes and standards compliance rates and emerging technologies drive the other two elements.

The difference between gross savings, as estimated by Navigant and HMG, and the net savings used to identify incremental uncommitted efficiency constitutes *naturally occurring savings*, or savings that could be expected to be realized without programs or codes and standards. As such, Energy Commission staff assumes that these savings are already captured within the baseline *CED 2011* forecasts.[11] For the sake of completeness, naturally occurring savings corresponding to the measures that make up incremental uncommitted efficiency, net of savings not related to programs or codes and standards included in *CED 2011* (price effects), are included as line items in the detailed results for electricity but are not included in the incremental uncommitted totals. On the natural gas side, naturally occurring savings were relatively trivial and much lower than projected Energy Commission price effects, so are not listed in the detailed results.

11 Since *CED 2011* does not include a detailed analysis of potential future efficiency behavior, a case can be made that at least some of these naturally occurring savings are not captured and should be decremented from the forecast. However, an analysis to determine a reasonable portion to be subtracted is beyond the scope of this work.

Stakeholder Comments

On June 18, 2012, Energy Commission staff presented a preliminary version of the incremental uncommitted saving estimates to the Demand Analysis Working Group. Written comments were received from PG&E, SCE, and SDG&E together (Joint IOUs),[12] the Division of Ratepayer Advocates jointly with the Natural Resources Defense Council (DRA/NRDC), and The Utility Reform Network (TURN). Comments are summarized below, along with a staff response to each. The full comments will be provided to the CPUC along with this memo.

1. The codes and standards savings estimates in the *2012 Potential Study* are based on outdated economic/demographic assumptions and should be revised to incorporate the severe drop in new construction during the recent recession. (Joint IOUs)

   Staff response: staff agrees and, as discussed in the previous section, has revised the incremental uncommitted savings attributable to building standards (Title 24). HMG reduced these savings, based on construction data supplied by the California Building Industry Association.

2. Naturally occurring savings corresponding to program-related measures and codes and standards should not be included in the incremental uncommitted savings totals. There is no basis for determining which if any portion of these savings should be subtracted from the *CED 2011* baseline forecasts. (Joint IOUs)

   Staff response: as discussed in the previous section, staff agrees and did not include naturally occurring savings in the calculation of the preliminary or revised incremental uncommitted savings estimates. These savings are included as line items in the detailed results for electricity but are not included in the incremental uncommitted totals.

3. The incremental uncommitted savings estimates should include emerging technologies in the mid savings case. (DRA/NRDC)

   Staff response: the preliminary incremental uncommitted estimates for the mid savings case excluded ET impacts because of their inherent uncertainty. After discussion with CPUC staff, Energy Commission staff decided to include ET in the mid case since these savings were included in the 2012 Potential Study (the basis for the mid savings case). Energy Commission staff's main charge was to estimate the portion of potential savings incremental to CED 2011 rather than to determine the efficacy of the various types of potential savings. Potential ET savings were excluded only in the low savings case. The final determination on ET will be made during the LTPP process.

4. The incremental uncommitted savings estimates should include some approximations of the impacts of BBEES. These approximations could be based on the 2009 Energy

12 Sempra Utilities commented on the natural gas estimates for SoCalGas and SDG&E, stating that the general trends for these numbers are consistent with Sempra projections for the *2012 California Gas Report* (from email correspondence with Herb Emmrich, Gas Demand Forecast and Economic Analysis Manager, Sempra Utilities, week of July 9-13, 2012).

Commission/Itron work, updated for the passage of time. Recommended updates are provided in the comments. (DRA/NRDC)

Staff response: Estimates for potential savings from BBEES were not included in the 2012 Potential Study and staff considers the 2009 BBEES estimates to be outdated, as well as only marginally defensible at the time. Staff will transmit the suggested updated approximations for BBEES to CPUC staff for their consideration. The CPUC Goals Study expected later this year will incorporate BBEES. (Note: TURN also believes BBEES estimates based on the 2009 work should not be included.)

5. Naturally occurring savings, particularly the portion corresponding to codes and standards, seem high and require further study. (TURN)

   Staff Response: Staff in the Energy Efficiency and Renewables Division at the Energy Commission (which develops codes and standards and estimates their impacts) shares this concern. Navigant has stated that these savings will be revisited for the CPUC Goals Study later this year.[13] Energy Commission staff will be involved in the Goals Study analysis and plan to spend time focusing on this issue.

Detailed Results

The spreadsheets posted with this memo [www.energy.ca.gov/2012_energypolicy/documents/index.html#EnergyDemandForecast under "Managed Forecast Energy Efficiency Adjustments"] provide results by program-related measure and code/standard category at the utility level as well as totals for all IOUs combined.

13 Email correspondence with Amul Sathe, Navigant, July 9, 2012.